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CHARACTERIZATION OF MICROSTRUCTURE IN METALLIC AND
COMPOSITE MATERIALS(U) DREXEL UNIV PHILADELPHIA PA DEPT
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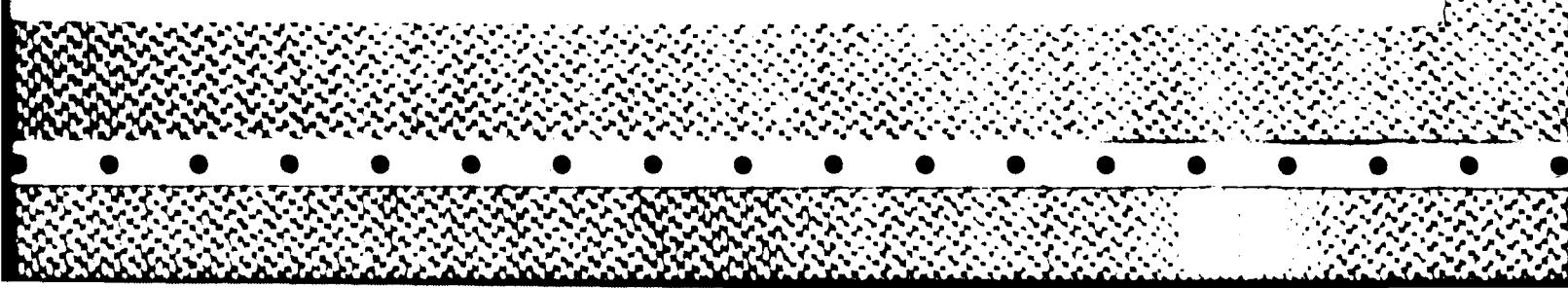
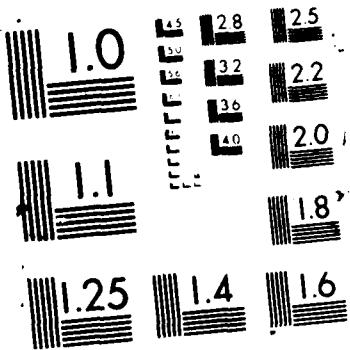
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FINAL REPORT

"CHARACTERIZATION OF MICROSTRUCTURE IN METALLIC
AND COMPOSITE MATERIALS"

AFOSR GRANT #85-0045

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August 1987

SUMMARY

As a result of AFOSR Grant #85-0045, Drexel University's Department of Materials Engineering has acquired a state-of-the-art optical metallograph and an image analysis system. The latter interfaces with the optical metallograph and a scanning electron microscope. All the items that were ordered have been delivered and installed to provide a fully operational facility.

ITEMS OF EQUIPMENT

Optical Metallograph

The base unit purchased was a Zeiss Model ICM 405 Metallograph. It was chosen after a careful survey of equivalent alternative microscopes; primary selection criteria were image quality with maximum resolution and flatness of field down to the microscope's resolution limit ($\sim 0.3\mu\text{m}$), convenience in use, range of accessories, and interface stability with a TV camera for image analysis.

The major components of the Zeiss Metallograph are:

- inverted camera microscope
- quintuple revolving nosepiece
- stage
- light sensor
- exposure meter
- halogen illuminator
- TV camera adaptor



Image Analysis System

The image analysis system acquired was the Lemont Scientific OASYS Plus System. A major consideration in the selection of this unit was the fact that the microprocessor hardware (DEC LSI 11/73) interfaces with both the Zeiss Metallograph and the scanning electron microscope.

The optical analysis system (Model DV-4400) for interfacing with the Zeiss Metallograph is designed to perform image enhancement, feature measurement and

classification, utilizing a conventional TV camera. Hardware components of the optical analysis system are:

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- video display, camera and acquisition
- computer
- disk storage
- computer display
- digitizing tablet
- printer
- modular camera stand
- modular desk console

In addition, the necessary compatible software was acquired.

Interface with the scanning electron microscope utilizes a line profile analyzer (Model DA10). This enables the operator to perform quantitative image analysis directly from the specimen in the microscope. In addition, the unit can determine relative x-ray intensity classification on the basis of chemistry. Component hardware includes:

- x-y line monitor
- integrated control panel -
- threshold selector
- digital scanner
- image selector
- 8 channel video module
- image recorder

The major software package is for diameters analysis and playback.

USAGE OF EQUIPMENT

The new metallograph and dual image analysis system are in daily use in the quantitative characterization of microstructural features encompassing a wide range of metallic and non-metallic alloy systems and composites. System specifications are compatible with the scale and complexity of the multiphase microstructures produced via powder metallurgy, rapid solidification and spray processing. A prime example is afforded by the new class of dispersion-strengthened aluminum base alloys (e.g. Al-Fe-Ce, Al-Fe-Ni) for elevated temperature service.

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